

METHOD AND APPARATUS FOR LOCAL AREA NETWORK IMPLEMENTATION

TECHNICAL FIELD

[0001] Embodiments of the present invention relate generally to communication technology, and, more particularly, relate to a method, apparatus, and computer program product for implementing secondary networks for cooperative communications with a primary network.

BACKGROUND

[0002] The modern communications era has brought about a tremendous expansion of wireline and wireless networks. Computer networks, television networks, and telephony networks are experiencing an unprecedented technological expansion, fueled by consumer demand. Wireless and mobile networking technologies have addressed related consumer demands, while providing more flexibility and immediacy of information transfer.

[0003] Current and future networking technologies continue to facilitate ease of information transfer and convenience to users. In order to provide easier or faster information transfer and convenience, telecommunication industry service providers are developing improvements to existing networks. In this regard, for example, improvements are being made to the universal mobile telecommunications system (UMTS) terrestrial radio access network (UTRAN). Further, for example, the evolved-UTRAN (E-UTRAN) is currently being developed. The E-UTRAN, which is also known as Long Term Evolution (LTE), is aimed at upgrading prior technologies by improving efficiency, lowering costs, improving services, making use of new spectrum opportunities, and providing better integration with other open standards.

[0004] Additionally, telecommunications devices are being developed that connect to radio networks as well as other networks such as local area networks. In this way, a device may be able to offload certain communications from the radio networks to the local area networks, which may serve to alleviate the burden placed on the radio networks. Systems supporting such functionality typically rely on pre-existing local area networks that provide an access point to the Internet. Furthermore, devices operating in these systems generally conduct communications independently without regard to the other devices connected to the same local area network.

[0005] Accordingly, it may be desirable to provide systems, methods, apparatuses, and computer program products for implementing secondary networks for cooperative communications with a primary network.

SUMMARY

[0006] In a wide area network, a base station cell may be connected to multiple devices operating within the network at any given time. A network operator may wish for certain devices to join or establish local area networks (LANs) to assist with cooperative communications and/or offloading to help reduce network traffic. The network operator may further desire to provide rules and criteria for when certain devices should join and/or establish certain LANs. The network operator may also wish to prevent certain devices lacking the necessary capabilities or exceeding a certain distance from other devices from joining a particular LAN and/or participating in cooperative communications. A need, there-

fore, exists to allow a network operator to provide configuration information to terminal apparatuses that instruct them when to join and/or establish such LANs for the purposes described above. Various embodiments of the invention described below seek to offer solutions to the problem by providing apparatuses and methods for implementing secondary networks for cooperative communications with a primary network.

[0007] Methods, apparatuses, and computer program products are herein provided for implementing secondary networks for cooperative communications with a primary network. Systems, methods, apparatuses, and computer program products in accordance with various embodiments may provide several advantages to computing devices, computing device users, and network providers. Some example embodiments advantageously enable a network entity, such as a base station, to distribute instructions to connected devices instructing when the devices should join and/or establish LANs. In this regard, the base station may provide the information to the devices via a static Access Network Discovery and Selection Function Management Object or, in certain embodiments, real time commands. Once connected to these LANs, various embodiments advantageously allow the devices to offload certain traffic through an Internet portal offered by the LAN. For example, the Internet portal may connect the LAN to another network that forwards traffic to the Internet. In other embodiments, the devices may cooperate with each other to send and receive data to and from the base station. For example, a device may distribute the data to be transmitted to other devices in the LAN, and all of the devices may then transmit the same data to the base station at the same time, for example using cooperative multiple-input and multiple-output (MIMO) communications. Cooperative communication among local network devices may enable more power efficient transmissions to the wide area network. For example, each device may require less power to transmit to a base station in the wide area network due to the distribution of the transmission across multiple devices. Similar methods may be used to receive data from the base station in cooperation with other devices. Collaborative reception according to some embodiments may advantageously allow a device in the LAN to receive the data from the base station and forward the data to the device in the LAN for which it is destined, thereby reducing the active wide area reception time for the one or more devices of the LAN.

[0008] Some advantageous embodiments allow a network entity, such as a base station, to monitor the various LANs operating in the area. The base station, in various embodiments, may instruct certain devices to establish, join, change, or disconnect from particular LANs in order to control at least the number, size, frequency usage, and location of LANs in the area. In this regard, a base station may have improved control over the routing and traffic within the wide area network through the use of the LANs. By monitoring the position of the devices (e.g., via geolocation), available LANs, and the current traffic and congestion of the wide area networks, example advantageous embodiments may allow the base station to determine when a device should or should not be connected to a LAN. In this way, the devices may be able to reduce power consumption by avoiding constant connection to the LANs and/or continuous attempts to search for and/or initiate LANs (e.g., listening for and/or transmitting a beacon) when unnecessary.